
वायवीय कंक्रीट के वियोजकों की विशिष्टि

(पहला पुनरीक्षण)

Pneumatic Concrete Breakers — Specification

(First Revision)

ICS : 91.100.30;91.220

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भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDARDS

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Construction Plant and Machinery Sectional Committee, had been approved by the Mechanical Engineering Divisional Council.

This standard, first published in 1966. In this revision amendment No. 1 have been incorporated.

In this revision the following major changes are:

- a) Terminology has been widened, and
- b) Sound/Noise power level determination has been added to the safety requirements of breaker.

Hand-held pneumatic concrete breakers have a wide variety of uses in general construction, demolition work and in industrial plants. Breakers of heavy class are used for breaking concrete pavements, demolition of concrete foundations and walls, cutting pavements and sub-bases, trenching in hard ground and for breaking boulders, which cannot be otherwise blasted. Breakers of medium class are suitable for breaking light concrete pavements and floors, macadam, frozen ground and gravel. Breakers of light class are useful in light demolition work on floors, pavements and masonry walls. Light breakers are particularly suitable for jobs requiring the operator to handle the tool continuously and for work, which is required to be carried out close to existing structures. This standard has been prepared with a view to provide guidance to manufacturers and users in obtaining pneumatic concrete breakers capable of giving satisfactory performance.

Heavy class breakers can be converted into sheeting drivers. Heavy and medium breakers can also be converted into railway spike drivers by substituting a spike-driver head in place of the regular front head.

Moil points can be substituted by various other breaking tools, such as narrow and wide chisels, digging blades, frost wedges, asphalt cutters, clay spades and scoops, tamping pads and pipe or sheeting driver heads.

For the purpose of deciding whether a particular requirement of this standard is complied with; the final value observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PNEUMATIC CONCRETE BREAKERS — SPECIFICATION

(*First Revision*)

1 SCOPE

This standard lays down the requirements for sizes, dimensions and performance of pneumatic concrete breakers.

2 REFERENCES

2.1 The standards listed below are necessary adjuncts to this standard. At the time of publication, the editions indicated were valid. All standards are subject to revisions and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated.

<i>IS/ISO No.</i>	<i>Title</i>
7995 : 1994	Pneumatic concrete breaker shanks — Dimensions
ISO 4871: 1996	Acoustics — Declaration and verification of noise emission values of machinery and equipment
ISO 3744 : 2010	Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane
ISO 15744 : 2002	Hand-held non-electric power tools — Noise measurement code — Engineering method (grade 2)
ISO 28927-10 : 2011	Hand-held portable power tools — Test methods for evaluation of vibration emission — Part 10 : Percussive drills, hammers and breakers

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Breaker /Concrete Breaker/Pneumatic Breaker/ Pneumatic Concrete Breaker — A heavy or medium or lightweight percussive tool used for demolition work.

3.2 Percussive Tool — A tool in which the piston reciprocates in a cylinder and gives a blow at one end of its stroke.

3.3 Maximum Operating Pressure — Maximum air pressure at which a pneumatic concrete breaker may be operated.

3.4 Rated Air Pressure — Air pressure required at inlet port of the pneumatic concrete breaker to assure its rated performance.

3.5 Rated Speed/Frequency — Number of blows per minute of the pneumatic concrete breaker at no load and rated air pressure at its inlet port.

3.6 Whip Hose — Air hose connected between the main air hose and the pneumatic breaker for the purpose of providing more flexibility.

3.7 Routine Tests — Tests carried out on each pneumatic breaker to ascertain that it conforms to the physical and performance requirements, as laid down in this standard.

3.8 Type Tests — Tests carried out on a type pneumatic breaker to verify conformity to the performance requirements laid down in this standard.

4 MATERIALS

4.1 All materials used in the construction of pneumatic concrete breakers shall conform to the requirements of relevant Indian Standards.

5 SIZES

5.1 Pneumatic concrete breakers shall be classified according to their weight as under:

- a) *Light* — Up to 20 kg
- b) *Medium* — Over 20 kg and up to 32 kg
- c) *Heavy* — Over 32 kg and up to 40 kg

NOTE — All weights shall be of the basic tool without any attachment or accessory.

6 CONSTRUCTION

6.1 General

The breaker shall consist of a back head assembly and a front head assembly. The back head assembly shall be equipped with a handle, a cylinder assembly and a throttle. The front head assembly shall be equipped with a chuck for pneumatic concrete breaker shanks

conforming to IS 7995 and having width across flats as 28.5 mm in case of light and medium breakers and 31.7 mm in case of heavy breakers. Unless otherwise specified, the handle shall be a T-handle.

6.2 Back Head Assembly

The back head assembly shall consist of a housing of forged steel or any other equally suitable material, a T-handle and a throttle lever. The throttle lever shall be located to permit operation of the breaker from either side.

6.2.1 Cylinder Assembly

The cylinder assembly shall consist of a cylinder of forged steel or any other equally suitable material, a valve mechanism to control the direction of air required for actuation of the piston, an anvil block sleeve and a reversible piston.

6.2.2 Flanges

All flanges shall have sufficient thickness and strength to prevent failure during operation and to withstand mechanical stress when back head and front head assemblies are installed.

6.3 Front Head Assembly

The front head assembly shall consist of a chuck housing of forged steel or any other equally suitable material, a chuck suitable for pneumatic concrete breaker shanks conforming to IS 7995 and a positive shank retaining device, such as latch retainer or swing stirrup type spring retainer. The chuck housing of the breaker shall contain a renewable liner or shall be of solid type.

6.4 Air Inlet Connection

The air inlet connection shall permit operation of the breaker without any obstruction to the normal working or any restraint on the operator. If so required by the purchaser, swivel type air inlet connection may be provided. The end of the air inlet connection shall have an extended thread and shall be provided with a nipple suitable for connection to 20 mm air hose.

6.5 Exhaust Port

The exhaust port shall be located to direct exhaust air downward and away from the operator when the breaker is operated from either side.

6.6 Air Cushion

The cylinder shall have a suitable air cushion at both ends of the piston stroke.

6.7 Lubrication

All surfaces of the pneumatic concrete breaker requiring

lubrication shall be provided with means for lubrication through the use of an internal in-built oil reservoir and an external airline oiler. The internal in-built oil reservoir of the breaker shall have a capacity of not less than 25 min of continuous operation while operating at 6.5 kg/cm² gauge air pressure.

7 WORKMANSHIP

7.1 The breaker shall be free from defects resulting from contact of dissimilar metals, rust, cracks, incomplete welds and other defects that could impair its operation or serviceability. All parts, components and assemblies including castings, forgings, moulded parts, stampings, bearings, seals, machine surfaces and welded parts shall be cleaned free of sand, dirt, fins, pits, sprues, scales, flux and other harmful or extraneous materials. External surfaces shall be smooth and all edges shall be rounded or bevelled.

8 SAFETY REQUIREMENTS

8.1 The breaker shall be provided with a positive lock, so as to prevent the accessory from becoming accidentally disengaged from the breaker. It shall be fitted with vibration resisting equipment and shall be so designed that the vibrations and recoil under working conditions are within the limits specified in relevant safety regulations.

8.2 Mechanical Safety

8.2.1 Surfaces, Edges and Corners

Accessible parts of the pneumatic breaker, except the inserted tool, shall not have sharp edges or angles or rough or abrasive surfaces.

8.2.2 Supporting Surface and Stability

The pneumatic breaker shall be so designed that it can be laid aside and remain in stable position on a plane surface.

8.2.3 Ejection of Parts

A retaining device shall be an integral part of the pneumatic breaker to prevent ejection of themoil point/cutting chisel or any other accessory during operation.

8.2.4 Construction

The pneumatic breaker shall be so designed and constructed so as to prevent loosening or loss of components during its expected use, including rough handling and occasional dropping, without compromising safety functions.

8.3 Noise

8.3.1 Latest technical progress and availability of means for reducing noise shall be taken into consideration for

design and construction of the pneumatic breakers, so that emission of noise is reduced to the lowest level. Where the exhaust air or gases are the major contributors to noise; means to reduce the noise, for example a silencer or equivalent means, shall be included in the design.

8.3.2 If specifically agreed to between the purchaser and the supplier, the exhaust gases shall be piped away from the operator through a hose, for reducing noise level near the operator.

8.4 Vibrations

Latest technical progress and availability of means for reducing vibrations shall be taken into consideration for design and construction of the pneumatic breakers, so that vibrations are reduced to the lowest level at the gripping handles of the breakers.

8.5 Lubricating Oil

While specifying lubricants, the manufacturer of pneumatic breakers shall take environment and occupational health hazards into consideration.

8.6 Ergonomics

8.6.1 Gripping area of the handles shall be designed so as to provide convenient and effective means for operator's full control over the pneumatic breaker. The grips shall be such that normal feed force can be transmitted in an ergonomic way from the hands of the operator to the pneumatic breaker.

8.6.2 Handles and other parts used for gripping the pneumatic breaker shall be designed to ensure its perfect grip by the operator to perform the expected work. The handles shall suit the functional anatomy of the hands and the dimensions of the hands of the operator population.

8.6.3 Unless otherwise specifically agreed to between the purchaser and the supplier, the pneumatic breaker shall have provision for grips of both hands of the operator for its lifting and operation.

8.7 Controls

8.7.1 Start and Stop Device

The 'start and stop device' shall be adapted to the handles of the pneumatic breaker so that the operator can activate it without releasing grip of the handles and so that it can be held comfortably in run position. It shall be so designed that the inserted tool ceases to be powered when the 'start and stop device' is released. It shall be of the type "hold to run"; which means, when completely released without any manual effort, it shall move to the stop position.

8.7.2 Unintentional Start

The 'start and stop device' shall be so designed, positioned and guarded that the risk of unintentional start is minimized.

9 PERFORMANCE CHARACTERISTICS

9.1 General Conditions for Tests

9.1.1 Noise

The noise emission value shall be measured and reported in accordance with ISO 15744. The noise emission value and its uncertainties shall be declared in accordance with ISO 4871.

9.1.2 Vibration

Total vibration emission value of the pneumatic breaker shall be measured and reported in accordance with ISO 28927-10.

9.1.3 Unintentional Start

Compliance to **8.7.2** shall be verified for pneumatic concrete breakers upto 15 kg as follows:

- a) The retainer shall be mounted and not removed.
- b) The pneumatic breaker shall be connected to the compressed air supply and placed in any possible position and pulled over a horizontal plane surface by its whip hose.
- c) Operation of the 'start and stop device' shall not occur, when pulled over a length of 3 m.

9.1.4 The breaker shall be operable in any position. Performance characteristics of the breaker, when tested in accordance with **9.2** to **9.7** shall conform to the requirement given in Table 1.

9.2 Operational Test

The breaker shall be operated with compressed air supply at 5 to 7 kg/cm² pressure at its inlet air connection for not less than 100 h for breaking cement concrete or other demolition work, based on the category/classification of the pneumatic breaker. Inability of the breaker to complete this test, or presence of any of the following defects during operation shall constitute failure of this test:

- a) Accessory accidentally disengages from the breaker,
- b) Absence of oil vapour in the exhaust air,
- c) Air supply hose interferes with the operator when breaker is operated in all possible positions,
- d) Evidence of damage, or permanent deformation or breakage of any component or part of the breaker,

Table 1 Physical and Performance Characteristics
(Clause 9.1.4, 9.4 and 10.3)

Sl No.	Characteristics	Light Breaker	Medium Breaker	Heavy Breaker	Test Requirements	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Piston speed (under no load/blows per minute)	1 425.1 575	1 090.1 575	1 025.1 570	The measured piston speed shall be within the limits specified in this table and shall not vary by more than ± 5 percent of the value stipulated by the manufacturer	Routine test
ii)	Operational seat	—	—	—	Shall comply with the requirements of 9.2	Type test
iii)	Temperature humidity test	—	—	—	Shall comply with the requirements of 9.3	Type test (see 10.1.1)
iv)	Air consumption (at 6.5 kg/cm ² gauge pressure at tool) 1/min, <i>Max</i>	1 640	2 230	2 710	When tested in accordance with 9.4 air consumption shall be below the values specified in this table and within ± 2 percent of the value stipulated by the manufacturer	Routine test
v)	Pellet test, compression of pellet, mm, <i>Min</i>	5	3	5.1	When tested in accordance with 9.5 , the compression of the pellet shall not be less than the value specified in this table	Routine test
vi)	Noise level test	—	—	—	Shall comply with the requirements of 8.3 and 9.6	Type test
vii)	Vibration limit test	—	—	—	Shall comply with the requirements of 8.4 and 9.7	Type test

e) Exhaust air is not directed downward and away from the operator, and

f) Internal built-in oil reservoir has less than 25 min continuous operational capacity at 6.5 kg/cm² gauge air pressure at the breaker.

9.2.1 When furnished, the spike driver and sheeting driver shall be operated for not less than 10 h each. The spike driver shall drive rail road spikes and the sheeting driver shall drive planks of 50 mm and 75 mm thickness. Failure of the breaker to convert to and operate as a spike driver and a sheeting driver shall constitute failure of this test.

9.3 Temperature Humidity Test

For this test, the supply air for the compressor shall be obtained from the ambient temperature at which the test is being conducted. The breaker shall be subjected to an ambient temperature of $1^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$ at relative humidity of not less than 98 percent until the oil in the lubricator is stabilized at $1^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$. The breaker shall be operated for not less than 10 min. Any adjustment required shall be accomplished during this 10 min operating period. The breaker shall then be operated for not less than 1 h at $1^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$ and at a relative humidity of not less than 98 percent for breaking concrete or performing other demolition work. After this 1 h operation, the breaker shall be disassembled and examined. Failure of the breaker to operate properly, inability to break concrete or perform other

demolition work, evidence of excessive wear, or failure of any component shall constitute failure of this test.

9.4 Air-Consumption Test

Water displacement meter or any other equally suitable instrument shall be used to determine the quantity of air consumed per minute at 6.5 kg/cm² gauge air pressure at inlet connection of the pneumatic breaker. Air consumption in excess of that specified in Table 1 shall constitute failure of the breaker in this test.

9.5 Force of Blow Test (Pellet Test)

9.5.1 The force of blow of the breaker shall be measured by the pellet test. Under this test, the breaker is operated for a specified period to beat down a cylindrical test piece (pellet) of steel of known tensile strength and machined to close limits, and measuring the reduction in length of the pellet.

9.5.2 The test gear shall consist of a firm and solid steel base upon which a removable substantial pot with hardened steel bush and having a vertical opening of 32 mm diameter is mounted with dowels. Typical details of a suitable solid base are given in Fig. 1, though any other suitable firm and solid base may be used by agreement between the purchaser and the supplier.

9.5.3 The breaker shall be fitted with a blank steel plunger 30 mm in diameter, approximately 2.15 kg in weight and hardened to RC-55 throughout. The shank dimensions of the plunger shall conform to IS 7995

FIG. 1 TYPICAL DETAILS OF SOLID BASE FOR PELLET TEST

9.5.4 The cylindrical test piece (pellet) of mild steel of 44 to 55 kg/mm² tensile strength and hardness RB 85-90 and of dimensions indicated below shall be vertically placed in position in the pot of the impact/force of blow testing machine.

<i>Sl No.</i>	<i>Breaker Category</i>	<i>Pellet Dimensions</i>	
		Dia, mm	Length, mm
i)	Light	$14.3^{+0.000}_{-0.050}$	$14.3^{+0.000}_{-0.025}$
ii)	Medium	$25.4^{+0.00}_{-0.050}$	$25.4^{+0.000}_{-0.025}$
iii)	Heavy	$25.4^{+0.00}_{-0.050}$	$25.4^{+0.00}_{-0.025}$

9.5.5 The compression (reduction in length) of the pellet shall be measured by means of a micrometer and reported.

9.6.1 The acoustic environment, instrumentation and measurement procedure shall be as specified in ISO 3744.

9.6.2 The sound power level shall be given as A-weighted sound power level in decibels, with reference of 1 pW. The A-weighted sound pressure level, from which the sound power is to be determined, shall be measured directly and not calculated from frequency band data.

9.6.3 Noise emission level of the pneumatic breaker shall be declared by the manufacturer in his technical leaflets and instruction manuals.

Any of the following information concerning vibrations transmitted by the pneumatic breaker shall be declared by the manufacturer in his technical leaflets and instruction manuals:

9.7.1 Declaration that the acceleration does not exceed 2.5 m/s^2 , as determined by the appropriate test code.

9.7.2 Declaration of the weighted root mean square acceleration value to which the arms are subjected, if it exceeds 2.5 m/s^2 , as determined by the appropriate test code.

9.7.3 If no test code is applied for measurement of vibrations, the manufacturer shall indicate the

measurement methods and conditions under which the measurements were taken.

10 TESTS

10.1 Type Tests

The following tests shall constitute the type tests:

- a) Operational test (*see 9.2*),
- b) Temperature-humidity test (*see 9.3*),
- c) Sound power level test (*see 9.6*), and
- d) Vibration level test (*see 9.7*).

10.1.1 Temperature humidity test shall be optional type test depending upon the specific agreement between the purchaser and the supplier. This test shall be applicable only to breakers for use at high altitudes and very low temperatures.

10.2 Routine Tests

The following shall constitute the routine tests:

- a) Piston speed/blows per minute test,
- b) Air-consumption test (*see 9.4*), and
- c) Pellet test (*see 9.5*).

10.3 If so specified in the purchase order, tests shall be carried out at the manufacturer's works in the presence of purchaser or his representative to ensure that the breaker conforms to the requirements of this standard and complies with the routine tests indicated in **10.2**. When a batch of 30 or more similar breakers are supplied in one order, type tests as specified in **10.1** and **10.1.1** and Table 1, shall be made on one of these breakers, if the purchaser so desires.

10.4 Test Certificates

10.4.1 Unless otherwise specified in the purchase order, manufacturer's test certificates shall be accepted for the type tests conducted on a breaker identical in essential details with the one purchased, in compliance to the requirements of **10.1** and **10.1.1**, together with routine tests on each individual breaker.

10.4.2 Certificates of routine tests shall show that the breaker purchased has been run and has been found to be sound and in working order in all respects, as specified in this standard.

10.4.3 Certificates/records of all type tests carried out on an identical breaker, shall be kept available by the manufacturer, for inspection by the purchaser.

11 ACCESSORIES AND ATTACHMENTS

11.1 Accessories

When so specified by the purchaser, the following accessories shall be supplied with the breaker;

- a) Chisel,

- b) Moil point,
- c) Tamping pad,
- d) Tamping rod,
- e) Air line oiler, and
- f) Silencer.

11.1.1 Chisel and Moil Point

The chisel and moil point shall be made of forged steel or any other equivalent material. They shall be supplied as normalized, hardened and tempered to hardness of minimum RC 55 throughout its length so that, if required, the hardness may be subsequently improved by user as per his requirements.

11.1.1.1 Dimensions

Unless otherwise agreed to between the purchaser and the supplier, the chisel and moil point shall have a length of 350 ± 12.5 mm exclusive of the shank and collar and the chisels shall have a cutting edge width of 75 ± 3 mm.

11.1.2 Tamping Rod

The tamping rod shall be made of forged steel conforming to relevant Indian Standards and shall be of a suitable shape as agreed to between the purchaser and the supplier (*see Note under 11.1.3*).

11.1.3 Tamping Pad

The tamping pad shall be of cast steel and shall be of a suitable shape, as agreed to between the purchaser and the supplier (*see Note below*). The weight of the tamping pad shall be not less than 6 kg.

NOTE — Suitable shapes of tamping rods and tamping pads generally in common use are given in Fig. 2.

11.1.4 Airline Oiler

External airline oiler shall have capacity of not less than 4 h of continuous operation while operating at 6.5 kg/cm^2 gauge air pressure at inlet connection of the pneumatic breaker.

11.2 Attachments

When so specified by the purchaser, the following attachments shall be furnished with the breaker:

- a) Spike driver, and
- b) Sheeting driver.

11.2.1 Spike Driver

The medium and heavy breaker shall be convertible for use as a spike driver by replacement of the standard front head with a front head constructed specifically for driving railroad spikes.

11.2.2 Sheeting Driver

The heavy breaker shall be convertible for use as a sheeting driver by replacement of the standard front

head with a front head constructed specifically for driving sheeting and planks. The sheeting driver shall be of forged steel and shall be adjustable for driving 50 to 75 mm planks.

12 TOOLS AND MANUALS

12.1 Maintenance and operating tools required for normal running adjustments and lubrication shall be provided with each pneumatic breaker along with necessary instructions. One set of the following manuals shall be supplied with each pneumatic breaker:

- Operation and maintenance manual,
- Manufacturer's instructions for safety and operation hazards, and
- Spare parts manual.

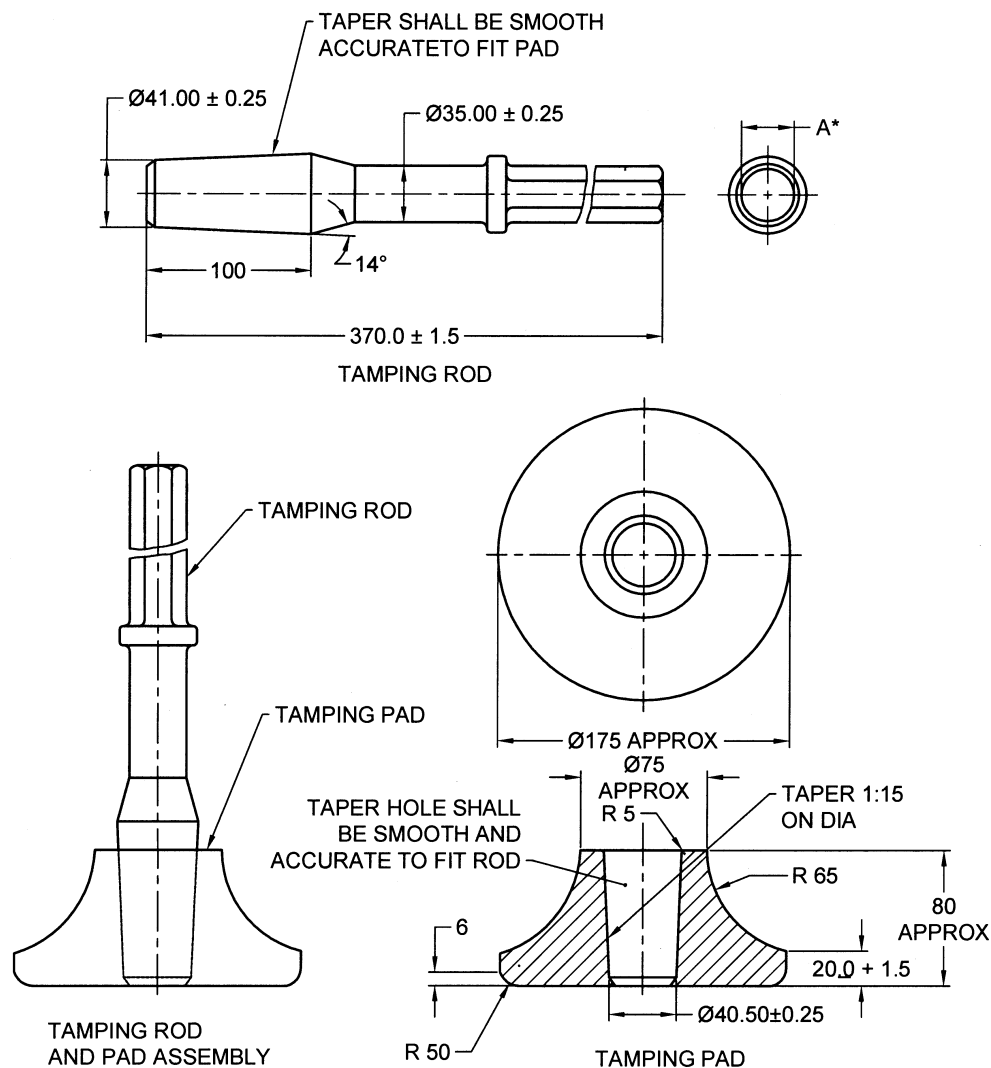
13 PAINTING

13.1 All exposed parts shall be cleaned and given suitable anti-corrosive treatment for protection against rust. The body shall be painted as per manufacturer's standard colour code or as per the paint colour stated by the purchaser in his purchase order.

14 MARKING

14.1 Each pneumatic breaker shall have the following information suitably marked on it:

- Manufacturer's name and trade-mark;
- Pneumatic breaker reference/model number;
- Month and year of manufacture;
- Weight of the breaker;



*A = 28.5 for Light and Medium Breaker, and 31.7 for Heavy Breaker.

All dimensions in millimetres.

FIG. 2 TYPICAL DETAILS OF TAMPING ROD AND PAD

IS 3559 : 2018

- e) Serial number of the breaker;
- f) Maximum operating pressure, rated air pressure; and
- g) Maximum air consumption (*see 9.4*).

14.2 BIS Certification Marking

The pneumatic concrete breaker may also be marked with the Standard Mark.

14.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which a license for the use of the Standard Mark may be granted to the manufacturers or the producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

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